

CLAIMS

I/We claim:

- [c1] 1. A system for detecting icing conditions external to a vehicle, comprising:
- a temperature sensor configured to direct a first signal corresponding to a temperature of an airstream;
 - a water content sensor configured to direct a second signal corresponding to a water content of the airstream; and
 - a processing unit coupled to the temperature sensor and the water content sensor to receive the first and second signals and, based on at least the first and second signals, provide an indication when at least the first and second signals taken together correspond to an at least incipient icing condition.
- [c2] 2. The system of claim 1 wherein the water content sensor includes at least one of a liquid water content sensor, a total water content sensor and an ice crystal sensor.
- [c3] 3. The system of claim 1 wherein the temperature sensor, the water content sensor and the processing unit are configured to mount to an aircraft.
- [c4] 4. The system of claim 1 wherein the temperature sensor and the water content sensor are positioned in a single housing.
- [c5] 5. The system of claim 1 wherein the water content sensor includes a heated wire positioned to be impinged by water contained in the airstream.

- [c6] 6. The system of claim 1 wherein the processing unit is configured to provide a positive indication of an at least incipient icing condition when the temperature sensor detects a temperature corresponding to a static temperature at or below a local freezing point for water, and the water content sensor detects liquid water.
- [c7] 7. The system of claim 1 wherein the temperature sensor and the water content sensor are positioned remotely from each other.
- [c8] 8. The system of claim 1 wherein the temperature sensor is configured to detect a total temperature of the airstream.
- [c9] 9. The system of claim 1 wherein the temperature sensor is configured to detect a total temperature of the airstream, and wherein the processing unit is configured to determine a static temperature of the airstream based at least in part on the first signal.
- [c10] 10. The system of claim 1 wherein the water content sensor includes a probe having a first surface positioned to face toward the airstream as the airstream travels along a flow axis, the probe further having a second surface facing opposite from the first surface, and wherein the temperature sensor includes a static air temperature sensor positioned at least proximate to the second surface of the probe, and wherein the system further comprises a housing, the housing being disposed around the water content sensor and the temperature sensor, the housing having an aperture positioned to receive the airstream, the aperture and the first surface of the probe being aligned along the flow axis.
- [c11] 11. The system of claim 1 wherein the processing unit is operatively couplable to a pressure sensor to receive a third signal corresponding to a

pressure of the airstream, and wherein the processing unit is configured to provide the indication based on the first, second and third signals.

[c12] 12. The system of claim 1, further comprising an aircraft having a fuselage portion, a wing portion, an empennage portion and a propulsion system, and wherein each of the temperature sensor, the water content sensor and the processing unit is carried by at least one of the fuselage portion, the wing portion, the empennage portion and the propulsion system.

[c13] 13. A system for detecting icing conditions external to a vehicle, comprising:

temperature sensing means configured sense a temperature of an airstream and direct a first signal corresponding to the temperature;
water content sensing means configured sense a water content of the airstream and direct a second signal corresponding to the water content; and

processing means coupled to the temperature sensing means and the water content sensing means and configured to receive the first and second signals and, based at least on the first and second signals, provide an indication when at least the first and second signals taken together correspond to an at least incipient icing condition.

[c14] 14. The system of claim 13 wherein the temperature sensing means, the water content sensing means and the processing means are configured to mount to an aircraft.

[c15] 15. The system of claim 13 wherein the temperature sensing means and the water content sensing means are positioned in a single housing.

- [c16] 16. The system of claim 13 wherein the processing means is configured to provide a positive indication of an at least incipient icing condition when the temperature sensing means detects a temperature corresponding to a static temperature at or below a local freezing point for water, and the water content sensing means detects liquid water.
- [c17] 17. The system of claim 13 wherein the temperature sensing means and the water content sensing means are configured to be positioned remotely from each other.
- [c18] 18. The system of claim 13 wherein the water content sensing means includes a probe having a first surface positioned to face toward the airstream as the airstream travels along a flow axis, the probe further having a second surface facing opposite from the first surface, and wherein the temperature sensing means includes a static air temperature sensor positioned at least proximate to the second surface of the probe, and wherein the system further comprises a housing, the housing being disposed around the water content sensing means and the temperature sensing means, the housing having an aperture positioned to receive the airstream, the aperture and the first surface of the probe being aligned along the flow axis.
- [c19] 19. A method for detecting icing conditions external to a vehicle, comprising:
- receiving a first signal corresponding to a temperature of an airstream external to a vehicle;
 - receiving a second signal corresponding to a water content of the airstream; and
 - based on at least the first and second signals, automatically generating an indication when at least the first and second signals taken together correspond to an at least incipient icing condition.

- [c20] 20. The method of claim 19 wherein receiving the second signal includes receiving the second signal from at least one of a liquid water content sensor, a total water content sensor and an ice crystal sensor.
- [c21] 21. The method of claim 19 wherein the processes of receiving the first signal, receiving the second signal and automatically generating an indication of claim are performed on board an aircraft.
- [c22] 22. The method of claim 19 wherein receiving the first and second signals includes receiving the first and second signals from sensors positioned in a single housing.
- [c23] 23. The method of claim 19, further comprising:
determining when the temperature sensor detects a temperature corresponding to a static temperature at or below a local freezing point for water;
determining when the water content sensor detects liquid water; and
generating the indication only when both the temperature sensor detects a temperature corresponding to a static temperature at or below a local freezing point for water and the water content sensor detects liquid water.
- [c24] 24. The method of claim 19 wherein receiving the first signal includes receiving the first signal from a temperature sensor and wherein receiving the second signal includes receiving the second signal from a water content sensor positioned remotely from the temperature sensor.
- [c25] 25. The method of claim 19 wherein receiving a first signal includes receiving a first signal corresponding to a total temperature of the airstream, and

wherein the method further comprises determining a static temperature of the airstream based at least in part on the first signal.

- [c26] 26. The method of claim 19, further comprising:
receiving a third signal corresponding to a pressure of the airstream; and
determining whether the first signal corresponds to a temperature at or
below which water freezes, based on the first signal and the third
signal.